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Frequency Comb Generation in Superconducting Resonators[1]
DAVID PAPPAS, ROBERT ERICKSON, MICHAEL VISSERS, HSIANG-SHENG KU, NIST — We have generated frequency combs spanning 0.5 to 20 GHz in superconducting λ =2 resonators at T =3 K. Thin films of niobium-titanium nitride enabled this development due to their low loss, high nonlinearity, low frequency dispersion, and high critical temperature. The combs nucleate as sidebands around multiples of the pump frequency. Selection rules for the allowed frequency emission are calculated using perturbation theory, and the measured spectrum is shown to agree with the theory. Sideband spacing is measured to be accurate to 1 part in 10^8 The sidebands coalesce into a continuous comb structure observed to cover at least several frequency octaves. Generation of combs in this frequency range allows for unprecedented analysis of this non-linear phenomena in the time domain.

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